Log No. __21-GP1-231 Rev_

STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

Washington State Energy Code Development

Standard Energy Code Proposal Form

Code being amended: ☐ Commercial Provisions ☒ Residential Provisions

Code Section # **C406.1 Additional energy efficiency credit requirements**

Brief Description:

Adding an additional Efficiently Package credit to C406.1. Providing a benefit to buildings that install heat pump dryers.

Proposed code change text: (Copy the existing text from the Integrated Draft, linked above, and then use underline for new text and ~~strikeout~~ for text to be deleted.)

Code Section	Commercial Building Occupancy					
	Group R-1	Group R-2	Group B	Group E	Group M	All Other
	Additional Efficiency Credits					
13. Heat Pump clothes dryers.	1.0	1.0	NA	NA	NA	NA

C406.13 Heat pump clothes dryers. All domestic clothes dryers located in Group R-1 and R-2 of the whole building, building addition, building area, occupancy type or tenant space are ENERGYSTAR rated heat pump dryers. No other types of clothes dryers are permitted for residential and individual use, to be installed during initial build-out or later. Credit applies only to buildings where heat pump dryers are within each residential dwelling or sleeping units or grouped together in central multi-family use laundry rooms.

Purpose of code change:

The addition of this 406 Credit will help to incentivize multifamily buildings that use dryers to get the typically more expensive but significantly more efficient heat pump dryers. Per the ENERGYSTAR website, clothes dryers are the appliance that consume the most energy in a typical household, so this is a major way to lower typical energy use.

Your amendment must meet one of the following criteria. Select at least one:

- ☐ Addresses a critical life/safety need.
- ☐ The amendment clarifies the intent or application of the code.
- ☒ Addresses a specific state policy or statute. (Note that energy conservation is a state policy)
- ☐ Consistency with state or federal regulations.
- ☐ Addresses a unique character of the state.
- ☐ Corrects errors and omissions.

Check the building types that would be impacted by your code change:

- ☒ Single family/duplex/townhome
- ☒ Multi-family 1 – 3 stories
- ☒ Multi-family 4 + stories
- ☐ Commercial / Retail
- ☐ Institutional
- ☐ Industrial

Your name	Austin Bonnes	Email address	austinb@rushingco.com
Your organization	Rushing Co	Phone number	217-721-2977
Other contact name	Click here to enter text.		

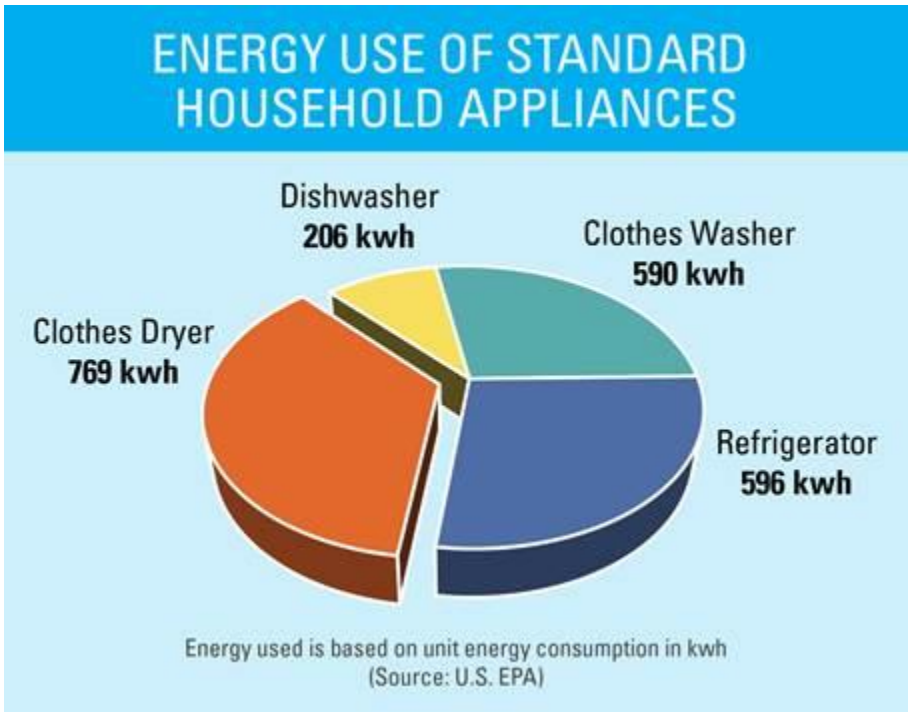
Instructions: Send this form as an email attachment, along with any other documentation available, to: sbcc@des.wa.gov. For further information, call the State Building Code Council at 360-407-9278.

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.

Economic Impact Data Sheet

Briefly summarize your proposal's primary economic impacts and benefits to building owners, tenants and businesses.

1. Heat pump dryers will support the goal of hitting aggressive EUI target on the all projects
2. They do not require venting, reducing ductwork, amount of soffits, less coordination and less install time.
3. Per the ENERGYSTAR website, clothes dryers are the appliance that consume the most energy in a typical household (note we would not expect someone in a small studio apartment to use appliances as much as the "average" household) :



3. The EPA state that ENERGY STAR rated dryers save about 20% of energy compared to a standard dryer. Other sources have said that can be even higher when match with a energy saving washer to up to around 30% energy

Provide your best estimate of the construction cost (or cost savings) of your code change proposal? (See OFM Life Cycle Cost Analysis tool and Instructions; use these Inputs. Webinars on the tool can be found Here and Here)

$cost savings of $0.00-$0.30/square foot (For residential projects, also provide $0-300 cost savings / dwelling unit)

Show calculations here, and list sources for costs/savings, or attach backup data pages

The net difference between average cost ranges for (mid-range quality) conventional dryers are $350-$600 while heat pump dryers are $400-to $1100. From Condenser vs vented vs heat pump – which tumble dryer is best? | Trusted Reviews

Heat pump dryers do not need exhaust venting with averages to be about 60 feet x $2/ foot, with an average of three elbows at $10 each. With install about 5 hours to install at $40, plus coordination (architect, installer, and mechanical engineer) and drawings of venting at 4 hours per at an average cost of $75. The leaves us with an average apartment cost savings of dryer duct at $650. And assuming a slight increase in electrical cost add of $100.

Using the average dryer cost of heat pump dryer – conventional dryer = $750-$475 = $275 more in equipment

Equipment minus install savings on the mech and electrical cost $275+ (-$650+$100)= Net savings of $275

Provide your best estimate of the annual energy savings (or additional energy use) for your code change proposal?

0.00012 KWH/ square foot (or) 0.4 KBTU/ square foot

(For residential projects, also provide Click here to enter text.KWH/KBTU / dwelling unit)

Show calculations here, and list sources for energy savings estimates, or attach backup data pages

From Energy Star dryers database: (https://www.energystar.gov/productfinder/download/certified-clothes-dryers/)

We currently estimate project plug loads to be contributing about 4.2 kbtu/sf/yr to the overall EUI.

Since there is very little commons area on this project, almost all of that is dwelling unit plug load.

Assuming a standard dryer makes up about 25% of total plug load for apartments (accounting for other plug loads not shown in the pie-chart above, such as TVs, computers, etc), the dryer would be responsible for about 1 kBTU/SF/yr of energy use.

If we save 20% (per EnergyStar) of that, the HP dryers directly contribute a savings of 0.2 kBTU/SF/yr. This was a pretty quick calc, so lets say it's likely a range of 0.1-0.4 kBTU/SF/yr impact once we get the opportunity to sharpen our pencils a bit.

Additionally "Combined Energy Factor" is lbm/kWh. Energy Star kWh/yr is based on 283 cycles/year regardless of capacity, so best to use CEF for comparing different dryers.

Vented or Ventless	Type	Heat Pump Technology	Average of kWh/yr/cu-ft	Average of Combined Energy Factor (CEF)
Vented	**Electric**	Hybrid Heat Pump	71.8	4.5
	Gas	(blank)	91.4	3.5
Ventless	**Electric**	Heat Pump	40.9	7.6
		Hybrid Heat Pump	67.0	4.9
	Ventless Electric Compact 240V	Heat Pump	43.6	4.9
Grand Total			**81.5**	**3.9**

Example dryer energy use comparisons (for 1.8 BR/unit):

	CEF (Lbs/kWh)	kWh/yr/dryer	Notes
ESMF Baseline	2.71	668.2	*See below for CEF estimate*
ES Vented	3.93	460.8	*Avg ES Electric Vented CEF*
HP Dryers	7.59	238.5	*Avg ES HP CEF*

For 2517 Eastlake (177 units, 145k SF), dryer energy usage estimates:

	Dryer Energy Usage (kWh)	Dryer EUI (kBtu/SF/yr)
ESMF Baseline	118,271	2.75
ES Vented	81,561	1.90
HP Dryers	42,217	0.98

Load Source	Energy Consumption	Sensible/ Latent Load Fraction (4)
Refrigerator (1)	529 kWh/yr Baseline Building electricity usage (conventional unit) 423 kWh/yr Proposed Design electricity usage (ENERGY STAR unit)	1.00/0.0
Dishwasher (1)	206 kWh/yr Baseline Building electricity usage (conventional unit) 164 kWh/yr Proposed Design electricity usage (ENERGY STAR unit)	0.60/0.15
Clothes Washer (1)	In-unit clothes washers: 81 kWh/yr Baseline Building electricity usage (conventional unit) 57 kWh/yr Proposed Design electricity usage (ENERGY STAR unit) Commercial clothes washers: 196 kWh/yr Baseline Building electricity usage (conventional unit) 138 kWh/yr Proposed Design electricity usage (ENERGY STAR unit)	0.80/0.0
Cooking (2) (electric stove/range)	604 kWh/year	0.40/0.30
Cooking (2) (gas stove/range)	45 Therms/year	0.30/0.20
Clothes Dryer (2)(5)	Electric Dryer: kWh/yr = [418 + (139*Nbr)]*F Gas Dryer: Electricity: kWh/yr = [38 + (12.7*Nbr)]*F Gas: Therms/yr = [26.5 + (8.8*Nbr)]*F Nbr = Average number of Bedrooms in dwelling units. F = scale factor to account for increased number of cycles of common space clothes dryers. F=1 for in-unit clothes dryers. F=2.423 for common space clothes dryers.	Electric Dryer: 0.15/0.05 Gas Dryer: Electricity – 1.0/0.0 Gas – 0.10/0.05
Miscellaneous dwelling unit Plug Loads (3)	0.5 W/ft^2 or 1.05 kWh/FFA FFA = Finished Floor Area of living space in square feet	0.90/0.1

Baseline of 418+139*Nbr comes from this document: https://www.nrel.gov/docs/fy10osti/47246.pdf
Seems to be a CEF of 2.71 based on this calculator: P:\Engineering Technical Resources\Energy Modeling + Calculations\Appliances\B10 Analysis - New Construction 2011.01.26.xlsm

- Baseline dryer usage in this calculator doesn't specify CEF, but goal-seek design CEF to make design dryer usage match 418 + 139*Nbr yields a CEF of 2.71

List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application:

Inspector and plan reviewers will just need to very Heat pump used versus conventional dryers, and make sure they meet energy minimums/ENERGYSTAR.